

## Notes on Australian species of *Euchelus* and *Herpetopoma* (Gastropoda: Trochidae) with descriptions of five new species.

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Five new species of *Euchelus* and *Herpetopoma* are described: *Euchelus dampierensis* from Western Australia, *Herpetopoma corallina*, *H. elevata* from the Great Barrier Reef, *H. norfolkensis* from Norfolk Island and *H. howensis* from Lord Howe Island. *Euchelus* cf. *horridus* (Philippi, 1846) and *Euchelus gemmatius* (Gould, 1845) are recorded from Australia.

### Introduction

This paper deals with new species or species not previously reported from Australia belonging to *Euchelus* and related genera (*Euchelus sensu lato*). The southern Australian species of *Euchelus s.l.* are fairly well known, mainly thanks to work by Tate (1893) and Cotton (1959). The northern and western Australian species of *Euchelus s.l.* are much less well-known. In Queensland, there is an overlap with species occurring in the Indo West-Pacific, and species named by workers such as Pease (1863), Crosse (1863), Fischer (1875) and Souverbie and Montrouzier (1875) were studied.

Generic classifications are currently based on shell characters and, while in need of revision, are beyond the scope of this paper. The existing genera as listed in Hickman and McLean (1990) were used. *Euchelus s.l.* was used for species that could not easily be placed in one of the existing genera.

### Materials and methods

Material from the collections of the Australian Museum Sydney (AMS) and the Western Australian Museum Perth (WAM) was examined. Characters used in identification were shell shape and general appearance, sculpture, columellar and umbilical features, colour, protoconch and operculum (if available). Shell measurements were taken from terminal growth shells only. Height (h), maximum width (w) and height of the aperture (a) are indicated in mm. Numbers in parentheses behind localities indicate the number of specimens; multiple numbers indicate that there are more than one lot from the same locality.

### Taxonomy

Family Trochidae Rafinesque, 1815  
Subfamily Eucyclinae Koken, 1897  
Tribe Chilodontini Wenz, 1938

Diagnosis: Shells thick and highly ornate; some form of spiral and axial sculpture present in most species; often nodose or lamellose. Inside of aperture with columellar teeth and/or lirae or teeth on outer lip. Inside of shell nacreous. Operculum multispiral but with fewer volutions than that of other trochids (Hickman and McLean, 1990).

Chilodontini live worldwide, but mostly in tropical and subtropical seas and are found intertidally or in the shallow sublittoral.

Genera used for Australian species within this tribe are *Euchelus sensu stricto* (*s.s.*) Philippi, 1847, *Vaceuchelus* Iredale, 1929, *Herpetopoma* Pilsbry, 1889, *Danilia* Brusina, 1865, *Granata* Cotton, 1957, *Hybochelus* Pilsbry, 1889 and *Turcica* A. Adams, 1854. This paper will deal with the group of genera closely resembling *Euchelus*, which comprises *Euchelus*, *Herpetopoma* and *Vaceuchelus*. These genera are characterised by rounded whorls and impressed sutures (separating them from *Turcica*), with a simple outer lip (as opposed to the thickened outer lip of *Danilia*) and height and width are about equal (as opposed to the low-spired, flat shells of *Granata* and *Hybochelus*).

Of the five new species described here one is placed in *Euchelus s.s.* and four in *Herpetopoma*. One additional species of *Euchelus* is also discussed, as well as one species of *Euchelus s.l.*

#### A key to the Australian genera similar to *Euchelus*:

- Shell > 10 mm, spiral sculpture stronger than axial sculpture, imperforate or perforate, columella tooth absent or small compared to columella length ..... *Euchelus s.s.*  
 Shell < 10 mm, spiral sculpture stronger than axial sculpture, imperforate or perforate, columella tooth large compared to columella length ..... *Herpetopoma*  
 Shell with strong spiral as well as axial sculpture, imperforate to narrowly perforate, columella without tooth, shell colour mostly white, often with red spots .....  
 ..... *Vaceuchelus*

#### Genus *Euchelus* Philippi, 1846

Type species *Monodonta tricarinata* Lamarck, 1822.

#### *Euchelus cf. horridus* (Philippi, 1846)

Plate 1, f. 1, 2

*Trochus horridus* Philippi, 1846. p. 172, t. 27, f. 12. Pacific Ocean.

*Euchelus horridus* Pilsbry, 1889. p. 433, pl. 37, f. 17.

Description: Shell rather large and thick. Protoconch missing in all available specimens; teleoconch with four whorls, rounded; sutures deeply impressed. First whorl eroded. Second whorl with two primary ribs and two nodulated secondary ribs above highest primary rib. Third whorl with three secondary ribs, primary rib, secondary rib, primary rib and secondary rib. Last whorl with three primary ribs; above highest of these, up to five secondary ribs, size dependent; one secondary rib between first and second and second and third primary ribs. Lowest of primary ribs coincides with suture in previous whorls. Area below this rib with up to seven irregular secondary ribs. Between all these ribs, even finer ribs may be present. Whole surface of shell, except

for primary ribs, with fine oblique axial lamellae, rendering spiral ribs nodulose. Sculpture further crossed by rough growth lines. Columella smooth, nearly straight, only slightly reflected. Umbilicus round, rather wide; umbilical area smooth. Outer lip weakly crenulate, inside finely lirate in adult shells. Colour mainly dirty purple, primary ribs alternating white and dark purple. Inside of shell and columella white. Umbilicus with tinge of purple.

Type material: Location: not known. Locality: Pacific Ocean

Measurements: (mm)

	h	w	a
Largest specimen	14.05	13.91	6.00
smallest adult specimen	8.19	8.27	3.90

Material studied: AMS: On beach below Crocodile Research Station, Maningrida, NT, beach and rocks (4, 7); Rocky reef, below Crocodile Research Station, Maningrida Arnhem Land, NT, on *Sargassum* (1 juvenile); on *Sargassum*, Melaka, W. Malaysia, on sheltered sand/mud flats (1, 1, 1)

Distribution: *E. cf. horridus*: Northern Territory; Malaysia.

*E. horridus*: India (Rajagopal and Mookherjee, 1978); Karachi (Melvill and Standen, 1901); Mediterranean (Rajagopal and Mookherjee, 1978).

Discussion: It is not possible to positively identify this species as *E. horridus* in the absence of type material. The Australian and Malaysian shells match the original description and illustration given by Pilsbry (1889) except that they do not have a denticle on the columella.

A similar species found in Karachi and the eastern Indian Ocean is *Euchelus asper* (Gmelin, 1791), which differs by being larger and imperforate and having closely packed secondary ribs in the interstices between the primary ribs. *E. circulatus* Anton, 1848 is also similar, but differs in having more primary ribs. *E. scaber* Fischer, 1878 differs in having three primary ribs on the penultimate whorl instead of two, and is white with red colouration instead of dark purple.

*Euchelus dampierensis* n. sp.

Plate 1, f. 3, 4

Description: Shell medium-sized, high-spired for genus, umbilicate. Protoconch consisting of 1 1/4 whorls; teleoconch with 4 to 5 whorls, rounded, sutures impressed. Shell always taller than wide. Protoconch black or white, terminated by a varix. First whorl with only small, curved, axial ribs. Second whorl with two fine spiral ribs, becoming nodulose. Third to fifth whorls with increasing number of spiral ribs until seven to eight equally spaced primary spiral ribs with one smaller secondary rib in interstices on body whorl, some specimens with primary and secondary ribs equal in strength, some with additional finer ribs in interstices. Interstices as wide as primary ribs, deeply excavated, crossed by axial, oblique lamellae, forming nodules at intersections with spiral ribs. Columella slightly concave, with small tooth. Umbilicus open, round, surrounded by smooth rib. Outer lip crenulate; lirate inside. Operculum

thin, circular, multispiral with a large last spiral. Colour mainly white, heavily and regularly mottled with brown. Apex black in some specimens. Shell interior nacreous, except white outer lip.

Type material: Holotype AMS C169482: Weld Is., WA, beach. Paratypes WAM 53-92: Learmonth, Exmouth Gulf, WA; 3 adult specimens, 1 juvenile.

Measurements: (mm)

	h	w	a
Holotype:	11.33	9.34	3.74
Paratypes:	11.47	8.66	3.55
	11.50	9.50	4.25
	7.16	6.21	3.20

Other material studied: AMS: Western Australia: South Cowaramup, on beach C169761 (1); off side road, 27 km S. of Exmouth town, on sand/stone flats C169754 (2); Broome, C69100 (1); Exmouth, beach opposite US base, N. of town towards Bundegi Reef C110617 (2); off side road, 27 km S. of Exmouth, on sand/stone flats C169753 (1); Broome, C169758 (1); Pt. Ganthaume, Broome, C169756 (1, encrusted with sponges); under rocks on reef, Pt. Hedland, C 169759 (1); N. side of Naval base, Exmouth, shallow extensive rock pools, 1/2 way across flats inside Bundegi Reef C169755 (1); Horrock's Beach, on limestone platform C 105914 (2), C169757 (1); E. side of Exmouth township, low to mid tide C169755 (2); Denham, Shark Bay, 3/4 - 1/2 km from shore, 1 - 3.5 m. on *Posidonia* & *Cymadocea* C169749 (1 juvenile); Reef between Roebuck Bay and Broome, C169760 (1); Denham, Shark Bay, C69330 (3); Useless Inlet, Shark Bay, C69249; Pelsart Is., Abrolhos Is., C69320 (1); Exmouth, C169750; Shark Bay, C69361; Useless Inlet, Shark Bay, dredged C169751 (4); Pt. Hedland, C169752 (2). WAM: Western Australia: Kalbarri, WAM53-92 (10); dredged off Cottlesloe, WAM54-92 (1).

Distribution: Western Australian coast from South Cowaramup to Broome, but more common in tropical areas; intertidal and shallow water, often washed ashore on beaches.

Etymology: Named after the Dampierian zoogeographical province.

Discussion: This common shell has probably remained unnamed because of its resemblance to *Euchelus aspersus* (Philippi, 1846). The new species can be separated from *E. aspersus* in its relatively high spire, less crowded, larger spiral ribs with much deeper interstices and by its umbilicus. In the Western Australian Museum, specimens belonging to this species were labelled *E. lischkei* Pilsbry, 1904. This well-known Japanese species is much lower spired, entirely brown and has much broader spiral ribs. Some specimens resemble *E. atratus* (Gmelin, 1791), but that species is much larger (height up to 26 mm vs. 12 mm), has more widely spaced and equal spiral ribs, weaker axial sculpture and is uniform dark purple. *E. rubrus* A. Adams, 1853 is much finer sculptured, has a stronger columellar denticle and is uniform red.

Genus *Herpetopoma* Pilsbry, 1889

Type species *Euchelus scabriusculus* Angas, 1867.

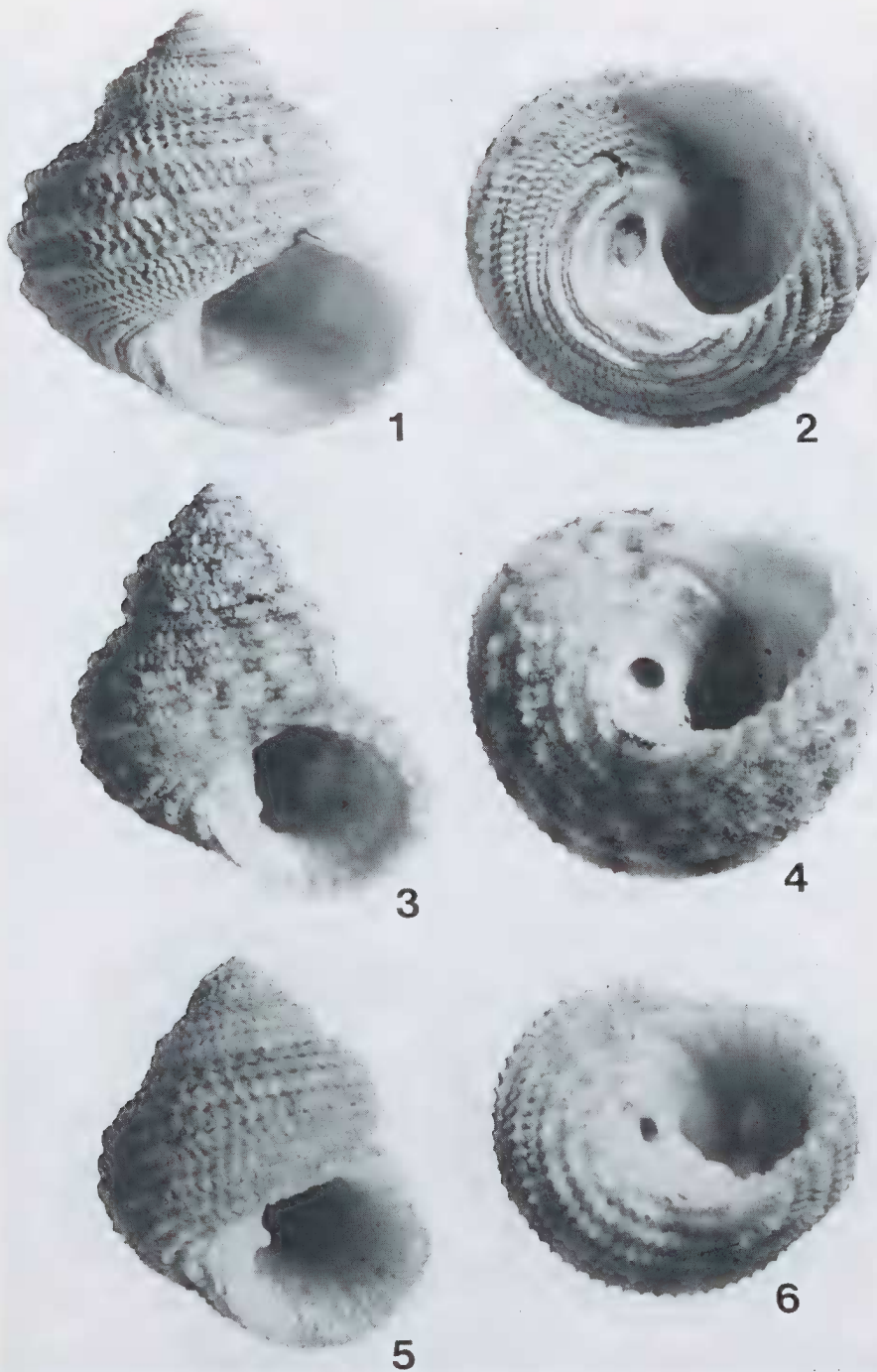


Plate 1. 1, 2 *Euchelus* cf. *horridus* (Philippi, 1846). Beach below Crocodile Research Station, Maningrida, Arnhem Land, NT, beach and rocks; 3, 4 *Euchelus dampierensis* n. sp. holotype; 5, 6 *Euchelus gemmatus* (Gould, 1845). Low Isles near Port Douglas, Qld.

*Herpetopoma corallina* n. sp.

Plate 2, f. 1, 2

Description: Shell small, thick, triangular, imperforate, sutures channelled. Protoconch 1 1/3 whorl, pitted. Teleoconch with 3 1/4 – 3 1/2 whorls. First whorl strongly axially ribbed. Two nodulose spiral ribs appear on second whorl, one just above suture, one in middle, a third appearing at about 2 1/4 whorl. Spiral ribs increasing in size until at about 3 1/4 whorl a fourth rib appears between first and second rib from above. Last whorl with four spiral rows of strong, sharp nodules above periphery, lowest slightly larger than top three, and forms prominent keel at periphery. Base with 5 smaller progressively less nodulose ribs; ones closest to umbilical area nearly smooth. Interstices between spiral ribs crossed by orthocone axial ribs, more or less continuous with nodules on ribs. Columella broad and reflected over umbilicus, almost totally closing it. Columella with small tooth, and rounded notch below. Outer lip undulated by ribs on outside, inside of aperture strongly lirate. Colour white, maculated with red below sutures.

Type material: Holotype AMS C169484 and three paratypes AMS C169485: Between South Is. and Bird Is., Lizard Is., Qld., 3 m.

Measurements: (mm)

		h	w	a
Holotype:		2.83	2.59	0.70
Paratypes:	largest:	2.68	2.50	0.76
	smallest	2.23	2.21	0.66

Other material studied: AM: Queensland: Euston Reef, off Cairns, 21 m., at bottom of sandy slope below steep coral walls, SW side of reef C169763 (13); Heron Is., Capricorn Group, 16 m. C169766 (1); Michaelmas Cay, off Cairns; Murray Is., 9 – 14.5 m. C48407 (14); Lady Musgrave Is., Bunker Group, dredged in lagoon C169765 (1); SE Heron Is., Capricorn Group, 3.5 m. C169762 (1); Yule Detached Reef 11°59'S, 143°58'E, rubble washings 15–9 m., outside face, S. end C169767 (1).

Distribution: Great Barrier Reef from Lady Musgrave Island, Capricorn Group, southern Barrier Reef to Lizard Island, North of Cooktown; 3 to 21 m.

Etymology: Latin *corallinus* = red, referring to the red spots on the top of the whorls.

Discussion: This species is different from all other species of *Herpetopoma* known in Australia because of its triangular shape and keeled body whorl. '*Euchelus*' *fimbriatus* Pease, 1861 from Hawaii is slightly larger, has a uniform white colour and is more rounded.

*Herpetopoma elevata* n. sp.

Plate 2, f. 3, 4

Description: Shell small, relatively thick, high spired and imperforate. Protoconch 1 1/3 whorls; teleoconch with 4 1/2 – 5 whorls, rounded, sutures deeply impressed. First whorl (eroded in all specimens) appears to have broad axial ribs. Second whorl with two spiral ribs, one above suture and in middle of whorl. Third and fourth whorl with

three spiral ribs; top rib smaller than bottom two. Last whorl with two spiral ribs of strong, nodules in middle of whorl, with narrower spiral rib consisting of smaller nodules above. Interstices slightly wider than ribs and with axial, broad, oblique ribs. Base with four smaller nodulose ribs, slightly more than their own width apart; nodules becoming obsolete toward umbilical area. Columella nearly straight, with small knob above notch at base; knob variable in strength. Outer lip undulate (result of external sculpture), dentate inside. Colour uniform white.

Type material: Holotype AMS C169486 and paratype AMS C169487: Euston Reef, outer Barrier Reef off Cairns, Qld. 21 m., at bottom of sandy slope below steep coral walls, SW side of reef.

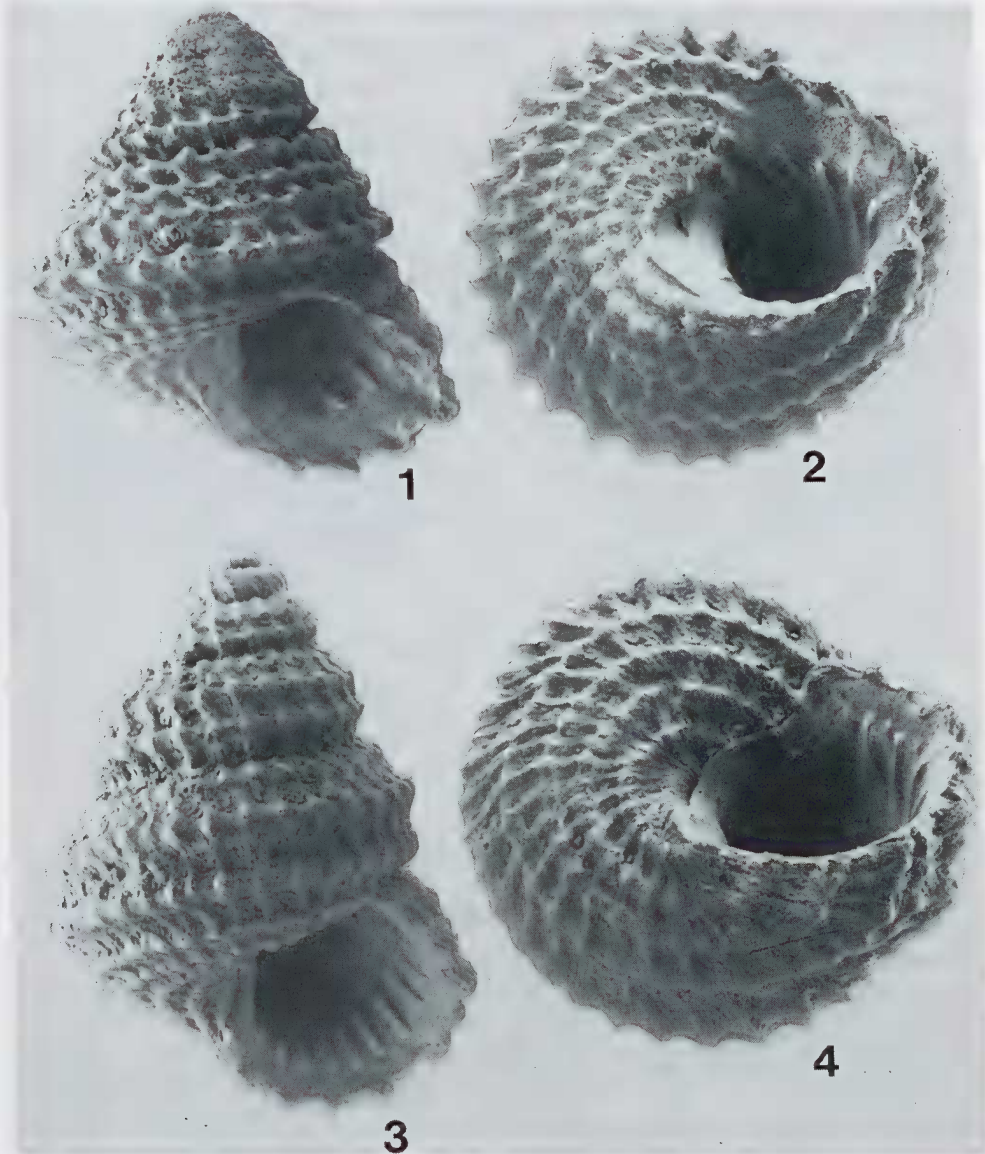


Plate 2. 1, 2 *Herpetopoma corallina* n. sp., holotype; 3, 4 *Herpetopoma elevata* n. sp., holotype.

## Measurements: (mm)

	h	w	a
Holotype:	3.56	2.58	0.94
Paratype:	3.18	2.41	1.00

Other material studied: AMS: Qld.: N. end, Carter Reef, 14°33'S, 145°36'E, outer face, coral rubble 27–30 m., C169808 (1); 3 km NE of Gillett Cay, Swains Reef, 64–73 m. C169809 (4); Gillett Cay, Swain Reefs, 27–37 m., dredged inside reef, coral rubble C169810 (5); Yule Detached Reef, rubble washings, 15–9 m., outside face, S. end C169811 (1).

Distribution: Great Barrier Reef from Gillett Cay, Swain Reefs, off Central Qld. to Yule Detached Reef off N. Qld.; 9 to 80 m.

Etymology: Latin *elevatus* = elevated, referring to the high spire.

Discussion: *H. fenestrata* (Tate, 1893) is a similar species, restricted to south-western Australia and differs from *H. elevata* in being more angulate and having fewer spiral ribs on the body whorl. '*Euchelus*' *fimbriatus* Pease, 1861 from Hawaii has four spirals on the last whorl and does not have rounded whorls.

*Herpetopoma norfolkensis* n. sp.

Plate 3, f. 1, 2

Description: Shell small, thick, rounded and imperforate, even in juvenile specimens. Protoconch 1 1/3 whorl, pitted; teleoconch with 3 3/4 whorls, flatly rounded, sutures slightly impressed. First whorl with axial ribs, two spiral ribs appear at 1/2 whorl. Early in second whorl third rib appears at suture above other ribs; at end of second whorl, fourth rib appears between first and second ribs. Third whorl with four spiral ribs. Last whorl with eight spiral ribs, four above periphery, closely crowded with nodules, linked across interstices by orthocone axial ribs, interstices forming deep narrow pits, especially clear in beachworn specimens. Columella straight, reflected, with small tooth at its base and four small nodules at reflected area. Outer lip sharp; inside with strong lirae. Colour off-white, sometimes maculated with red or pink.

Type material: Holotype AMS C169480: Norfolk Island. Paratype AMS C 169481: Emily Bay, Kingston, Norfolk Island, short mixed algae from rock platform.

## Measurements: (mm)

	h	w	a
Holotype:	5.22	4.99	1.79
Paratype:	4.45	4.66	1.43

Other material studied: AM: Bumbora Beach, Norfolk Is. C169819 (11); Bumbora Beach, N. side of Norfolk Is., shell sand C169820 (4); Beefsteak Bay, Norfolk Is., shell sand C169813 (5); Norfolk Is., S. Pacific, dredged C169817 (1); 31 m., off Duncombe Bay, Norfolk Is. C169821 (1 juvenile); Point Hunter Reserve, Norfolk Is., E. of cemetery, stone washings, low tide C169818 (1); Point Hunter Reserve, Norfolk Is., under calcarenite rocks to E. of cemetery, mid-tide C169822 (1 juvenile); Emily Bay, Kingston, Norfolk Is., S. side, stone washings from rock platform, low tide C169815 (1 juvenile); Norfolk Is. C169814 (12); Norfolk Is. C169816 (1); Norfolk Is C169823 (2);



Norfolk Is C169824 (8).

Distribution: Known only from Norfolk Island; intertidal to 31 m.

Etymology: Named after Norfolk Island.

Discussion: This species is similar to '*Euchelus*' *gemmatus* (Gould, 1845), but differs in being imperforate (even in juveniles), in having fewer spiral ribs, which are more equal in size and have more crowded nodules. The interstices are more strongly ribbed and the axial ribs are not oblique as in *E. gemmatus*. '*Euchelus*' *pauperculus* Lischke, 1872 is also similar to the new species but differs in having much more distantly nodulated spiral ribs and larger spaces between the axial ribs. Also, it is maculated with black and does not have a columella tooth. The new species also has some resemblance to *H. annectans* (Tate, 1893) from south-western Australia, but that species has more spiral ribs and fewer axial lamellae.

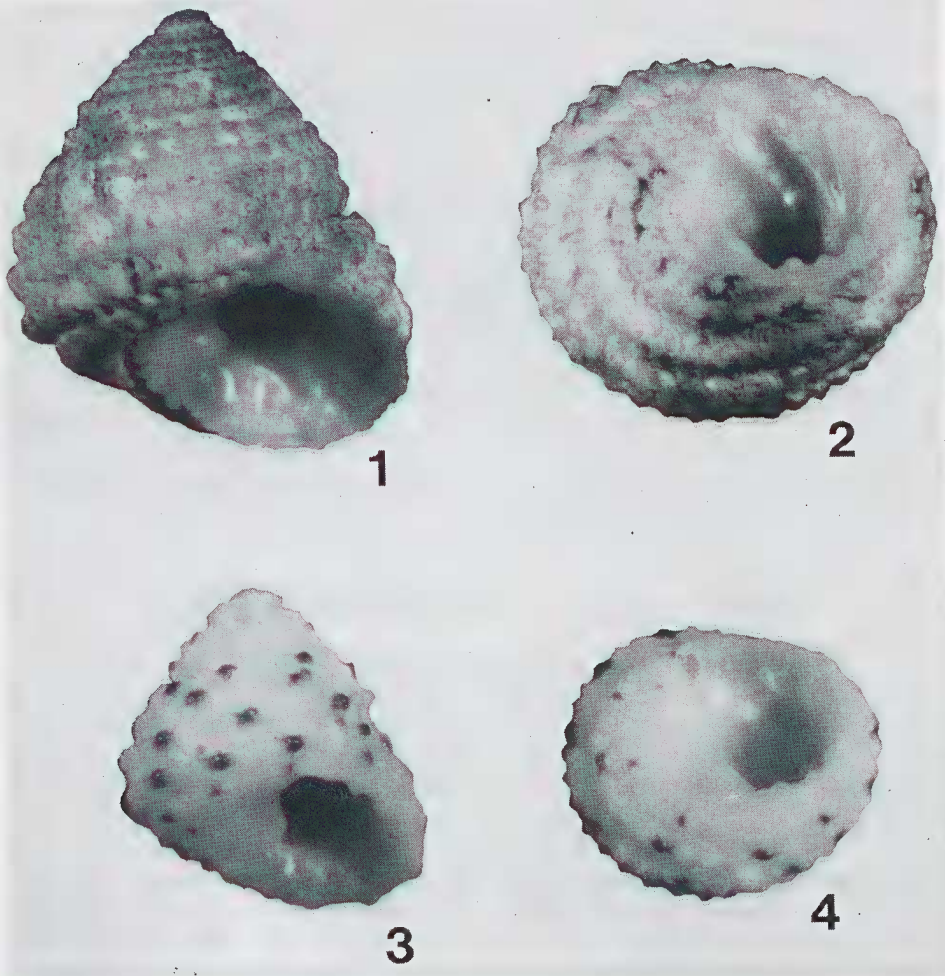


Plate 3. 1, 2 *Herpetopoma norfolkensis* n. sp., holotype; 3, 4 *Herpetopoma howensis* n. sp., holotype.

*Herpetopoma howensis* n. sp.

Plate 3, f. 3, 4

Description: Shell small, thick, imperforate. Protoconch missing in all specimens; teleoconch with  $3\frac{3}{4}$  whorls. Sides of spire straight; sutures slightly incised. First two whorls eroded, penultimate whorl with three spiral ribs, increasing to four spiral ribs above periphery on last whorl; with smaller spiral ribs in interstices. Base of shell with two larger and two smaller spiral ribs. Spiral ribs nodulose, with small oblique axial ribs linking nodules. Inside of outer lip lirate. Columella with small tooth. Colour white, with purple spots on spiral ribs.

Location of type material: Holotype AMS C169581 and nine paratypes AMS C169825.

Type locality: Holotype AMS C169581: Off Neds Beach, Lord Howe Is., 1 – 2 m., at low tide, algae washings. Paratypes AMS C169825: Lord Howe Island.

Measurements: (mm)

		h	w	a
Holotype:		3.90	3.68	1.30
Paratypes:	largest:	3.82	3.72	1.26
	smallest:	2.96	3.46	1.26

Other material studied: AMS: NE side Lord Howe Is. S. Pacific, dredged in up to 27.5 m. C169826 (1), C169828 (4); Lord Howe Is. C169827 (2).

Distribution: Lord Howe Island, intertidal to 27.5 m.

Etymology: Named after Lord Howe Island.

Discussion: This species is similar to *Herpetopoma pumilio* (Tate, 1893) from Western Australia, but is much larger and has oblique axial sculpture as opposed to orthocone ribs in *H. pumilio*. *H. norfolkensis* differs in being larger (height 5.2 vs 3.9 mm), having a more crowded sculpture, especially in the interspaces of the ribs, and lacking the typical purple spots on the ribs.

Genus *Euchelus* Philippi, 1846 *s.l.**Euchelus gemmatus* (Gould, 1845)

Plate 1, f. 5, 6

*Trochus gemmatus* Gould, 1845. p. 27. Hawaiian Islands.

*Trochus fischeri* Montrouzier, 1866. p. 142, t. 6, f. 7. New Caledonia.

*Euchelus gemmatus* Kay, 1979. p. 51, f. 13, 14E.

Description: Shell small, thick, umbilicate. Protoconch white, 1 whorl. Teleoconch with  $4\frac{1}{2}$  – 5 whorls, rounded; sutures deeply impressed. First whorl closely axially ribbed. Two spiral ribs appear at  $\frac{3}{4}$ th whorl, one just above suture, one just below middle of whorl, increasing in size on second whorl. At third whorl ribs start appearing in interstices until 10 – 12 spiral ribs on the last whorl, often with smaller ribs in

smaller ribs in interstices; five ribs above periphery. Interstices between ribs narrower than ribs, crossed by fine oblique axial ribs, coinciding with nodules, areas in between forming shallow rhombic pits. Columella convex with large tooth above deep notch below. Umbilicus narrow, deep, surrounded by strong rib. Outer lip crenulated by ribs on outside; lirate inside. Colour dirty off-white to yellowish, maculated with large spots of brick-red, this pattern continuing on base of shell.

Remarks: Some specimens, referred to below as cf. *gemmatus* are very similar to this species and differ only in being smaller, lighter in colour and having a slightly narrower umbilicus. However, these characters are not consistent enough to separate them as separate species.

Type material: Lectotype: MCZ 169169 New York State Museum, Albany, New York, USA: Sandwich (Hawaiian) Islands

Measurements: (mm)

	h	w	a
<i>E. gemmatus</i>			
Largest specimen:	9.16	7.58	3.03
smallest specimen:	4.27	3.98	1.35
<i>E. cf. gemmatus</i>			
largest specimen:	5.38	5.06	2.45
smallest specimen:	3.55	3.49	1.43

Material studied: *E. gemmatus* AMS: Australian material: Queensland: Stover Bay near Somerset, Cape York Peninsula C105683 (1); Reef W. side Prince of Wales Is., Torres Straits C109728 (1); Great Detached Reef, 7 m., coral sand gutter, seaward face C169483 (1); near Raine Is. C169830 (1); Low Isles near Pt. Douglas C169836 (14); 4 mile beach, Pt. Douglas C169829 (1); Murray Is., 9 – 14.5 m., Torres Straits C29933 (1); Mission Beach near Tully, beach C169834 (1 damaged).

Northern Territory: patch reef, N. side, 10 m., coarse shelly sand, New Year Is., NT C169831 (1); Off Pt. Charles, Darwin, NT, 27 – 36.5 m. C169832 (2);

Western Australia: WAM. W. side of Kendrew Is., near Dampier, WA (1)

Outside Australia: AMS. Tarawa, Kiribati (Gilbert Group) C8916 (2); New Caledonia: Noumea C3735 (1); Panie C4103 (1); Poindimie C169835 (1).

*E. cf. gemmatus*: Australian material: AMS: Qld.: Yonge Reef, E. of Lizard Is., 15 – 17 m., outer face, N. end C169839 (1); Michaelmas Cay, off Cairns C169840 (2); North West Is., Capricorn Group C169837 (1); Euston Reef, outer Barrier Reef, 21 m. at bottom of sandy slope below steep coral walls, SW side of reef C169841 (4); inner side of Carter Reef, off 'Platform bommie' C169842 (3), C169843 (1); Michaelmas Cay off Cairns, Qld., A53524 (5); Reef 21–230, Swain Reefs, 21°12'S, 152°20'E, 13–15 m., silted rubble wash in 'Blue Hole' C169838 (1).

Outside Australia: Point Bolton, Abaiang, Kiribati (North Gilbert Is.), 10 m., leeward reef slope, sand sievings C169844 (1).

Distribution: North West Is., Capricorn Group, S. Qld. to Kendrew Is, near Dampier, WA; intertidal to 40 m.; New Caledonia; Kiribati; Hawaii (Kay, 1979).

Discussion: Although commonly found washed ashore on beaches, this species has not previously been recorded from Australia. It is often found in conjunction with another small trochid species *Clanculus granosus* Brazier, 1877, to which it bears some superficial resemblance. The shell is variable in height, the strength of the columellar tooth and in the width of the umbilicus.

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#### Literature cited

- Cotton, B.C. (1959). South Australian Mollusca, Archaeogastropoda. Government Printer, Adelaide, 449 pp.
- Crosse, H. (1863). Description d'espèces nouvelles de l'Archipel Caledonien. *Journal de Conchyliologie* 1863: 178–181.
- Fischer, P. (1875). Catalogue des mollusques appartenant aux genres *Turbo*, *Calcar* et *Trochus*, recueillis dans les mers de l'Archipel Caledonien. *Journal de Conchyliologie* 1875: 44–51.
- Gould, A.A. (1845). Twelve new species of land shells from the Sandwich Islands. *Proceedings of the Boston Society of Natural History* 2: 26–28.
- Hickman, C.S. and McLean, J.H. (1990). Systematic revision and suprageneric classification of trochacean gastropods. *Science series, Natural History Museum of Los Angeles County* 35: 1–167.
- Kay, E.A. (1979). Hawaiian Marine Shells. Bernice P. Bishop Museum special publication, 653 pp.
- Montrouzier, R.P. (1866). Descriptions d'espèces nouvelles de l'Archipel Caledonien. *Journal de Conchyliologie* 14: 138–151.
- Pease, W.H. (1863). Descriptions of new species of marine shells from the Sandwich Islands. *Proceedings of the Zoological Society of London* 1862: 278–280.
- Philippi, R.A. (1846–55). Die Kreiselschnecken oder Trochoiden, Trochus. In: Martini, F.W.H. & Chemnitz, J.H., *Systematische Conchilien-Cabinet*, second edn., ed. H.C. Küster, Nurnberg, Bauer & Raspe 2 (3).
- Pilsbry, H. A. (1889). *Manual of Conchology*, Vol. XI, Trochidae, 519 pp.
- Rajagopal, A.S. and Mookherjee, H.P. (1978). Contributions to the molluscan fauna of India. Part I: Marine molluscs of the Coromandel coast, Palk Strait and Gulf of Mannar – Gastropoda: Archaeogastropoda. *Records of the Zoological Survey of India, Miscellaneous Publications, Occasional Paper* 12: 1–48.
- Souverbie, M. and Montrouzier, R.P. (1875). Description d'espèces nouvelles de l'Archipel Caledonien. *Journal de Conchyliologie* 1875: 33–44.
- Tate, R. (1893). On some new species of Australian marine Gastropoda. *Transactions of the Royal Society of South Australia* 17: 189–197.